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# THE CHARACTERS OF PTERANODON.

(Second Paper)

WITH TWO PLATES

By G. F. EATON.







ART. XXVIII.—*Characters of Pteranodon (Second Paper)*;  
by G. F. EATON. (With Plates XIX and XX.)

BRIEF notices of some of the characters of *Pteranodon* Marsh were published in this Journal in July, 1903. A restoration of *Pteranodon longiceps* is now about to be installed at St. Louis, which has been prepared under my direction as the contribution of the Department of Vertebrate Paleontology of the Yale Museum to the University's exhibit at the Louisiana Purchase Exposition. It is therefore advisable to describe such additional characters of *Pteranodon* as are manifest in the restoration.

A half-tone engraving of this restoration appears as Plate XIX.

*The Sclerotic Circle.*

The sclerotic circle is composed of twelve thin plates of bone arranged with overlapping edges, so as to form a hollow truncate cone similar in shape to the avian sclerotic circle. Plate XX, figure 1, shows the arrangement of these plates in the left orbit of a large head of *Pteranodon*. By removing the matrix from under the left side of the skull, which was crushed laterally, the circle was exposed pressed inward against the inter-orbital septum and with the component plates little disturbed from their normal position.

Professor Williston\* refers to the sclerotic circle of the allied genus *Nyctosaurus* (*Nyctodactylus*) in these words: "It had a ring of thin, large sclerotic plates, which were preserved in displaced positions. The separate plates were not united by imbrication, as in the mosasaurs." The chapter on the Pterosauria in the new edition of Zittel's Paleontology, 1902, as revised by Professor Williston, contains no description of this structure in either *Pteranodon* or *Nyctosaurus*. Oddly enough, in this revision, it is *Pteranodon* that is credited with a sclerotic circle, and not *Nyctosaurus* in which Professor Williston observed the structure.

*The Vertebrae.*

The most important note to be made here concerns the vertebral formula, which I have now determined. I have figured and described in this Journal (July, 1903) the series of vertebrae which are anchylosed together to support the ilia. Further investigation has shown the number of presacrals attributed to *Pteranodon* by previous writers to be incorrect. Instead of eight cervicals, as given by Professor Williston, there are in reality nine. In the dorsal series are included

\* Journal of Geology, vol. x, p. 528, 1902.

eight vertebræ anchylosed to form the notarium, and four free dorsals intervening between the notarium and the sacrum.

Professor Williston has been at considerable pains to demonstrate the number of cervical vertebræ in *Pteranodon* and *Nyctosaurus*, and it is from him I quote:\* “If, however, we consider that vertebra which bears the first rib articulating with the sternum to be the first dorsal, then I believe that the prevailing number of cervicals in pterodactyls is eight.

“From the foregoing, then, it seems assured that there is a free, short vertebra in front of the notarium, in both *Pteranodon* and *Nyctosaurus*, bearing a free, small rib, which does not unite with the sternum. This vertebra is the eighth cervical, and is probably present in all pterodactyls.”

Following the atlas and axis are five vertebræ with long centra, then two vertebræ with short centra, making nine cervicals in all. Plate XX, figures 2, 3, and 4, show the seventh, eighth, and ninth vertebræ in their correct sequence, the longest of the three being the seventh. As there is no doubt that the seventh is the most posterior of the long-bodied cervicals, it is here only necessary to illustrate and call attention to the last three cervicals, and to state that they were preserved in their normal arrangement and that the ninth was in contact with the first true dorsal or notarial vertebra, i. e., the first vertebra connected by ribs with the sternum. I hope to show later that Professor Williston is right in supposing that *Pteranodon* and *Nyctosaurus* have the same cervical formula. The number of cervicals in *Pteranodon*, however, is nine, and not eight as formerly supposed. Fortunately, the material in the Yale University Museum satisfactorily decides this mooted question.

In describing the specimen of *Nyctosaurus* upon which Professor Williston bases his calculation of cervical vertebræ (Osteology of *Nyctosaurus*), he says that the eighth cervical lay “close to the first notarial vertebra, and near the presternal process of the sacrum,” from which statement I must suppose his evidence less satisfactory than my own.

The four free dorsals which follow the notarium are shown in their normal sequence in figures 5, 6, 7, and 8, of Plate XX. Unlike the eight notarial vertebræ, these four were probably capable of slight motion. This is indicated by the character of the articular facets of the zygapophyses and of the ends of the centra. The figures correctly show transverse processes terminating in facets for the support of single-headed ribs. Like all the vertebræ in the entire vertebral column, so far as observed, these four free dorsals are procœlous.

\* On the Osteology of *Nyctosaurus*, Field Columbian Museum, Publication 78, pp. 127, 129, June 1, 1903.

By assuming that the first four vertebræ of the sacral series (in the broader sense) are homologues of the lumbar of other groups, the total number of presacral vertebræ would appear to be twenty-five. This compares closely with the supposed number of presacrals in the Eusuchia.

Paleontological Laboratory,

Yale University Museum, February 29, 1904.

#### EXPLANATION OF PLATES.

##### PLATE XIX.

FIGURE 1.—Restoration of *Pteranodon longiceps* Marsh; prepared from the original fossil bones, by H. Gibb, under the direction of G. F. Eaton, at the Yale University Museum, March, 1904. One twenty-fourth natural size.

##### PLATE XX.

FIGURE 1.—Left orbit and sclerotic circle of *Pteranodon*. The arrow points to the anterior extremity of the head.

FIGURE 2.—Seventh cervical vertebra of *Pteranodon*.

FIGURE 3.—Eighth cervical vertebra of *Pteranodon*.

FIGURE 4.—Ninth cervical vertebra of *Pteranodon*.

FIGURE 5.—Ninth dorsal vertebra of *Pteranodon*.

FIGURE 6.—Tenth dorsal vertebra of *Pteranodon*.

FIGURE 7.—Eleventh dorsal vertebra of *Pteranodon*.

FIGURE 8.—Twelfth dorsal vertebra of *Pteranodon*.

All the figures are three-fourths natural size, and illustrate the left side of the specimens.



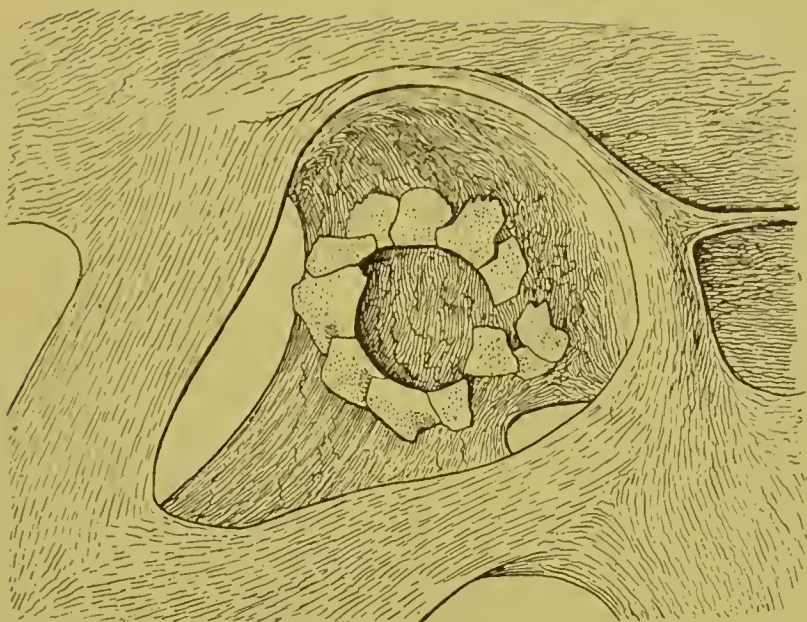
Restoration of *PTERANODON LONGICEPS* Marsh.  
One twenty-fourth natural size.



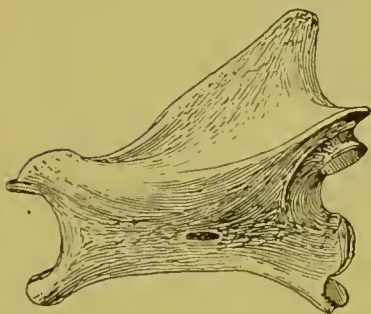




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PTERANODON Marsh.

